

REMARKS/ARGUMENTS

Applicants respond herein to the final Office Action mailed June 29, 2006.

Claims 1-9, 11, 13, 14, 16, 20-23, 25 and 27-29 are the claims currently pending in the present application.

Rejection of Claims 25, 28 and 29 Under 35 U.S.C. § 103

Claims 25, 28 and 29 are rejected under 35 U.S.C. § 103(a), as being obvious over Fujishima, US Patent No. 6,740,952 in view of Rumennik, US Patent No. 6,639,277.

Reconsideration of the rejection is respectfully requested.

Among the problems recognized and solved by applicant's claimed invention is that of reducing high electric field gradients at the surface of a semiconductor die (Applicant Disclosure, page 2, paragraph 5). According to an aspect of applicant's claimed invention, a field plate structure is used to solve these and other problems.

For at least the following reasons, the claims presented are neither anticipated by nor obvious from the cited art. By way of example, independent claim 25 requires the first field plate structure being disposed over a resurf region, wherein the first field plate includes a first portion spaced from a second portion by a first gap.

Fujishima discloses a high withstand voltage lateral MISFET device (Fujishima, Abstract), in which in an embodiment shown in Fig. 15, a p-type top layer 20 is provided and above which a gate electrode layer 9 is provided. Fujishima also discloses another embodiment shown in Fig. 19 (the seventh embodiment of Fujishima) with a first field plate FP1 separated by a gap from gate electrode 12 above which is located a second field plate FP2 laterally separated by a gap from field plate 3 FP3. The seventh embodiment shown in Fig. 19 does not disclose or suggest a resurf layer and the Examiner does not allege that this embodiment discloses or suggests such a layer.

The Examiner acknowledges that Fujishima does not disclose a first plate including a second portion spaced from the first portion of the first plate by a gap wider than the second gap (Office Action, page 3). However, the Examiner alleges that Rumennik discloses such a feature in the embodiments shown in Figs. 1 and 2.

Rumennik discloses a high-voltage transistor with a multi-layer conduction region in which one or more buried layers create an associated number of parallel JFET conduction

channels in the extended portion of the well region to provide a low on-state resistance (Rumennik, Abstract). Rumennik discloses a source electrode 10 and a drain electrode 11 located near the top surface of the die, and a buried gate 12 electrically isolated from the source electrode and the drain electrode, and a field plate member 26 laterally spaced from the gate electrode and connected to the drain electrode 11.

In making the rejection, the Examiner combines the p-type top layer 20 of the third embodiment of Fujishima shown in Fig. 15 with Fujishima's seventh embodiment shown in Fig. 19 which includes the FP1, FP2 and FP3 structures. The Examiner next combines Rumennik's embodiment shown in Rumennik Fig. 1. The Examiner alleges that such a combination of Fujishima's third and seventh embodiment with the embodiment of Rumennik shown in Fig. 1 would have been obvious to a person of ordinary skill in the art to reduce the field concentration at the boundary between the drain region and the drift region (Office Action, page 4).

First, it is respectfully submitted that it constitutes impermissible hindsight reconstruction based on applicant's own disclosure to seize upon these various disparate features and combine them to arrive at the combination recited in claim 25. No single embodiment cited by the Examiner discloses a field plate structure comprising:

- a first field plate; a second field plate disposed above and spaced from said first field plate; and
- a third field plate disposed above and spaced from said second field plate,
- said field plate structure being disposed over a resurf region, wherein said first field plate includes a first portion spaced from a second portion by a first gap, said second field plate includes a first portion spaced from a second portion by a second gap, and said third field plate includes a first portion spaced from a second portion by a third gap, and wherein said first gap is wider than said second gap and said third gap, and said second gap is wider than said third gap, and
- wherein said gaps are filled only with an insulation material,

as required by independent claim 25.

Rumennik discloses a structure significantly different from the embodiments of Fujishima. Rumennik discloses a source electrode 10 and a drain electrode 11 located near the top surface of the die. Fujishima by contrast discloses a source electrode 11 and a drain

electrode layer 12 in the middle of the embodiment of the die shown in Fig. 19. Thus, to arrive at the proposed combination to make the rejection, it is necessary for the Examiner to seize upon arbitrarily selected features of Rumennik and then insert them into the middle of the die shown in Fujishima at a location selected by the Examiner, and further, to change functions of the inserted embodiments. In addition, it would be necessary to seize the p-type top layer 20 of the third embodiment of Fujishima shown in Fig. 15, and insert this into the seventh embodiment of Fujishima shown in Fig. 19 just below the features taken from Rumennik.

In a similar vein, applicant respectfully submits that the teaching cited by the Examiner of reducing the field concentration at the boundary between the drain region and the drift region is too general to provide the motivation necessary for arriving at the proposed combination, involving features of two separate embodiments of Fujishima and additional features selected from Rumennik. Moreover, problems recognized and solved by applicant's claimed invention, such as the issue of reducing high electric field gradients at the surface of a semiconductor die, are not disclosed or suggested by the cited references. Accordingly, it is respectfully submitted that the structure recited in independent claim 25 would not have been obvious to a person of ordinary skill in the art based on Fujishima and Rumennik.

Claims 28 and 29 depend from independent claim 25 and thus incorporate novel and nonobvious features thereof. Therefore, claims 28 and 29 are patentably distinguishable over the cited art for at least the same reasons.

Rejection of Claims 1-9, 11, 13 and 20-23 Under 35 U.S.C. § 103

Claims 1-9, 11, 13 and 20-23 are rejected under 35 U.S.C. § 103, as being obvious over Fujishima in view of Rumennik, Van Zant and Ghandhi. Reconsideration of the rejection is respectfully requested.

Independent claim 1 requires:

a field plate structure disposed over said resurf region, said field plate structure including a first field plate disposed over a first insulation layer of a first thickness, a second field plate disposed over a second insulation layer of a second thickness, said second insulation layer being formed over said first insulation layer, and a third field plate spaced from said second field plate by a third insulation layer of a third thickness, wherein said first field plate includes a first

portion spaced from a second portion by a first gap, said second field plate includes a first portion spaced from a second portion by a second gap, and said third field plate includes a first portion spaced from a second portion by a third gap, and wherein said first gap is wider than said second gap and said third gap, and said second gap is wider than said third gap, and wherein said gaps are filled only with an insulation material.

As discussed, Fujishima and Rumennik, even together in combination, do not disclose or suggest such a field plate structure.

Van Zant and Ghandhi do not cure the above-cited deficiencies of Fujishima and Rumennik as they relate to the above-cited recitations of independent claim 1. Therefore, Fujishima, Rumennik, Van Zant and Ghandhi, even taken together in combination, do not disclose or suggest the recitations of independent claim 1.

Claims 2-9, 11, 13 and 20-23 depend from claim 1 and are thus patentably distinguishable over cited art for at least the same reasons.

Rejection of Claims 14 and 16 Under 35 U.S.C. § 103

Claims 14 and 16 are rejected under 35 U.S.C. § 103, as being obvious over Fujishima, Rumennik, Van Zant and Ghandhi in view of Noda, US Patent No. 6,617,652 and Ranjan, US Patent No. 5,801,431. Reconsideration of the rejection is respectfully requested.

Claims 14 and 16 depend from independent claim 1 and are therefore patentably distinguishable over the cited art for at least the same reasons. Noda and Ranjan do not cure the above-discussed deficiencies of Fujishima, Rumennik, Van Zant and Ghandhi as they relate to the above-cited recitations of independent claim 1.

Rejection of Claim 27 Under 35 U.S.C. § 103

Claim 27 is rejected under 35 U.S.C. § 103, as being obvious over Fujishima and Rumennik in view of Noda and Ranjan. Reconsideration of the rejection is respectfully requested.

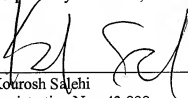
As discussed, Noda and Ranjan do not cure the above-discussed deficiencies of Fujishima and Rumennik as they relate to the above-cited recitations of independent claim 1.

Accordingly, claim 27, which depends from independent claim 1, is patentably distinguishable over the cited art for at least the same reasons.

In view of the foregoing discussion, reconsideration of the rejections is respectfully requested, and allowance of the claims of the application is believed to be warranted. Should the Examiner have any questions regarding the present Amendment or regarding the application generally, the Examiner is invited to telephone the undersigned attorney at the below-provided telephone number.

THIS CORRESPONDENCE IS BEING
SUBMITTED ELECTRONICALLY
THROUGH THE PATENT AND
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Respectfully submitted,



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